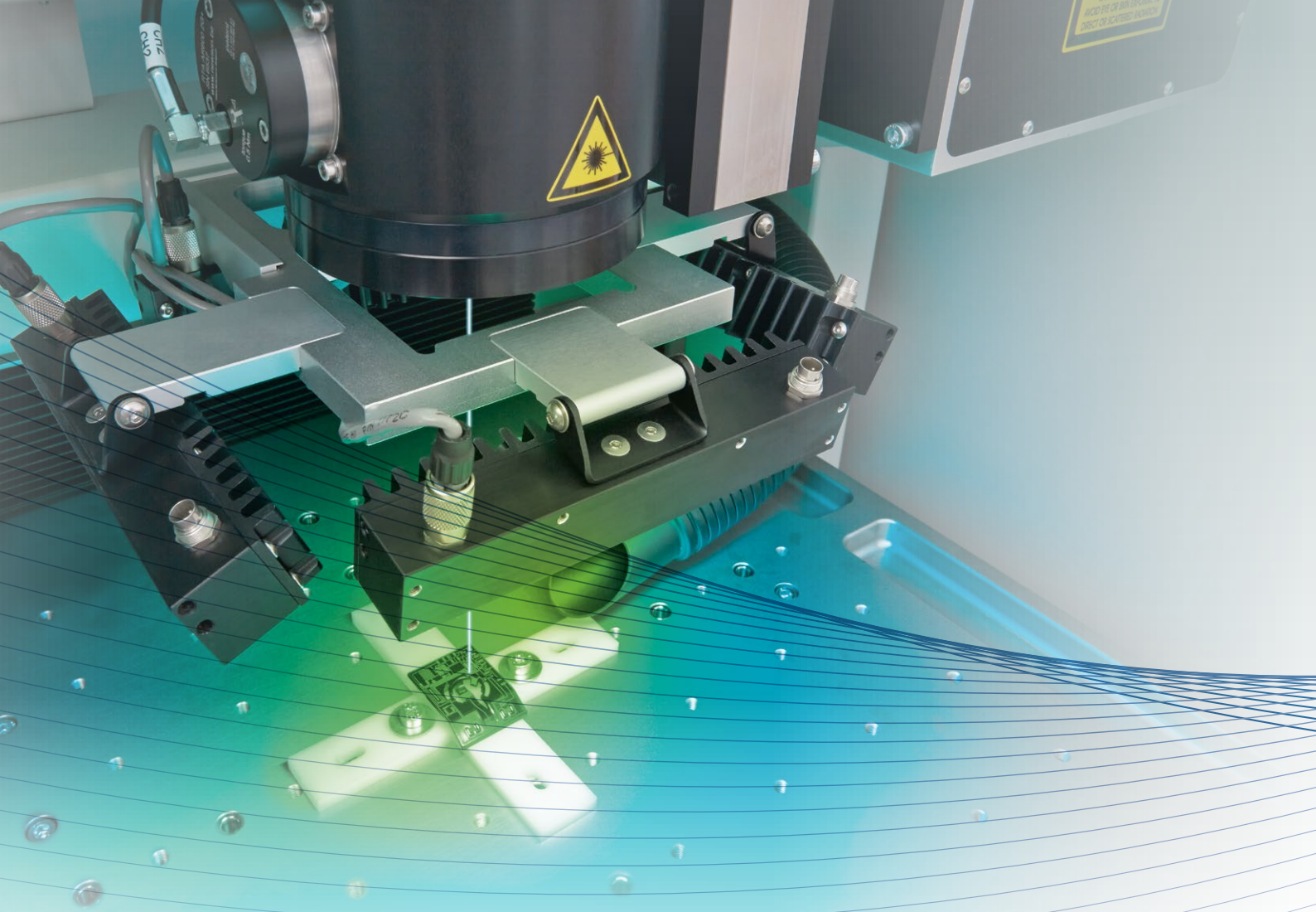
Structuring 3D Circuits

LDS Prototyping with the LPKF ProtoLaser 3D

LPKF
Laser & Electronics



Prototyping Three-Dimensional Circuits Using Lasers

Modern electronics products are showing a trend towards smaller size, greater complexity, and more functions. Extension of the interconnect pattern into the third dimension adds new potential – and laser direct structuring (LDS) is the leading technology in this field. With the ProtoLaser 3D, LPKF offers an economical and efficient laser system that accelerates prototyping of three-dimensional substrates.

Three-Dimensional Circuit Tracks

Well over half of all smartphones contain 3D circuitry. Existing plastic parts are turned into antennas or assume connection tasks. The basis for laser direct structuring is an injection-molded part made of a plastic that contains an LDS additive. The laser process exposes the additive, leaving a microrough surface. In a subsequent electroless metal deposition step, a metal coating is produced on the exposed, roughened paths.

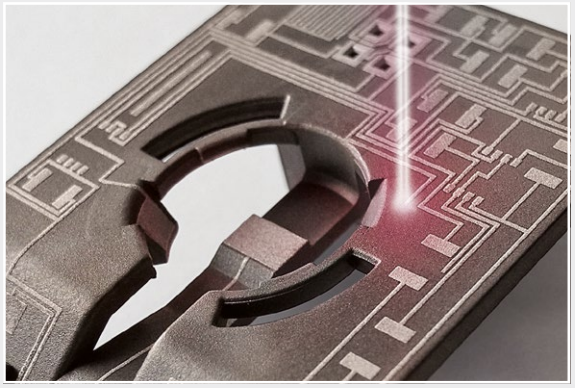
With LPKF ProtoPaint LDS, LPKF offers a spray paint that can be used to coat parts of any shape – even 3D printed parts – with a laser-activatable layer. The ProtoLaser 3D can structure this surface, and subsequent metal deposition using the prototyping system LPKF ProtoPlate LDS leads to a functional prototype.

- Compact – fits through every laboratory door
- Flexible and economical
- Complete LDS prototyping solution available

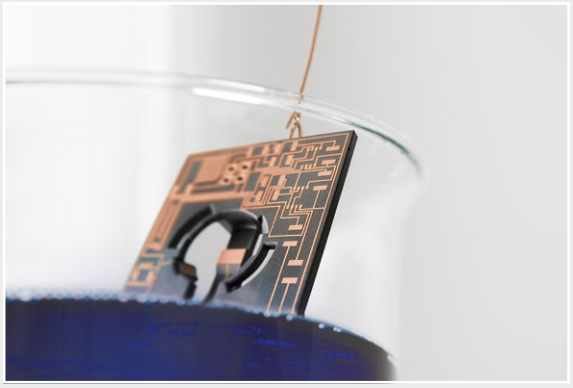
Prototyping with LPKF Laser Direct Structuring (LDS)

1. Creation of the three-dimensional blank

2. Painting of the blank with LPKF ProtoPaint LDS



3. Structuring of the circuit layout with the LPKF ProtoLaser 3D



4. Metal deposition with LPKF ProtoPlate LDS

Flexible Laser Machining

The LPKF ProtoLaser 3D creates new possibilities. It was developed especially for LDS prototyping but is based on the proven ProtoLasers used for PCB prototyping. The work platform with dimensions of 500 mm x 500 mm has a z-axis travel of 200 mm. A pilot laser and a powerful vision system aid in structuring. The laser optical components in the ProtoLaser 3D correspond to those used in the LDS production systems. The LDS design rules also apply to the prototyping process.

The ProtoLaser 3D imports data from conventional layout programs and is supplied with the powerful LPKF CircuitPro 3D CAM software. A simple, low-cost workpiece fixture can be used for structuring because no mechanical stresses are created in the process. The vision system detects fiducials and part contours and significantly simplifies structuring in different positions.

Worldwide LDS Prototyping Support

Users of LPKF prototyping laser systems around the world profit from application centers in Germany, USA, Japan, and China, where they have access to LPKF's extensive experience in laser machining of materials and can find qualified people to answer their technical questions and provide support with new processes and applications.

Technical Data: LPKF ProtoLaser 3D

Structuring area (X x Y x Z)	100 mm x 100 mm x 40 mm (3.9" x 3.9" x 1.6")
Max. material size (X x Y x Z)	300 mm x 300 mm x 130 mm (11.8" x 11.8" x 5.1")
Fixturing base plate (X x Y)	500 mm x 500 mm (19.7" x 19.7")
Z travel of the base plate	200 mm (7.8"), software controlled
Accuracy*	± 25 µm (1 Mil)
Laser wave length	IR range
Laser pulse frequency	10 – 100 kHz
3D structuring speed	1 000 mm/s (39.4"/s) [a]
Diameter of focused laser beam	50 µm ± 5 µm (1.7 Mil ± 0.2 Mil)
Software	LPKF CircuitPro 3D (included)
Features	Vision system in the optical axis of the laser beam with LED illumination, automatic suction control, controlled filter
System dimensions (W x H x D)	880 mm x 1 820 mm x 720 mm (34.6" x 71.7" x 28.3"), height with open door
Weight	300 kg (661.4 lbs), without exhaust unit
Operating conditions	
Power supply	110/230 V, 50/60 Hz, 1.25 kW
Ambient temperature	22 °C ± 2 °C (71.6 °F ± 4 °F)
Humidity	< 60 % non-condensing
Cooling	Air-cooled (internal cooling cycle)
Hardware and software requirements	Internal PC, Windows XP, 1 x external USB, 1 x internal USB, 1 x DVI (included)
Required accessories	Exhaust unit

* Calibrated scanfield

a Depending on material and laser beam parameters

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Photos may also show optional accessories.

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